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(71) Applicant: NITTO ELECTRIC INDUSTRIAL CO., LTD.  
No. 1-2, Shimohozumi 1-chome Ibaraki-shi  
Osaka(JP)

(72) Inventor: Hori, Yutaka  
Nitto Elec. Ind. Co. Ltd. 1-2, Shimohozumi 1-chome  
Ibaraki-shi Osaka(JP)

(72) Inventor: Matsumoto, Katsuo  
Nitto Elec. Ind. Co. Ltd. 1-2, Shimohozumi 1-chome  
Ibaraki-shi Osaka(JP)

(72) Inventor: Yamamoto, Katsuhiko  
Nitto Elec. Ind. Co. Ltd. 1-2, Shimohozumi 1-chome  
Ibaraki-shi Osaka(JP)

(72) Inventor: Sasaki, Toshimitsu  
Nitto Elec. Ind. Co. Ltd. 1-2, Shimohozumi 1-chome  
Ibaraki-shi Osaka(JP)

(72) Inventor: Shida, Masayuki  
Nitto Elec. Ind. Co. Ltd. 1-2, Shimohozumi 1-chome  
Ibaraki-shi Osaka(JP)

(74) Representative: Diamond, Bryan Clive et al,  
Gee & Co. Chancery House Chancery Lane  
London WC2A 1QU(GB)

(54) Method and composition for removal of hair from skin.

(57) A depilatory composition comprises an aqueous solution or emulsion (e.g. a paste or gel) of a depilatory agent, e.g. thioglycolic acid or a salt thereof, a film-forming polymer, which can be water-soluble, e.g. polyvinyl pyrrolidone, or insoluble, e.g. a rubber; and optionally an alkali, a hair swelling accelerating agent or a filler; it has a viscosity of 0.1 to 1,000 poises at 30°C.

The composition is spread on an area of skin having hair, the coating is allowed to dry naturally or by treating with hot air and/or by absorbing water into an absorbent sheet pressed onto the film; and the film is peeled off with the hairs embedded therein, optionally with use of a pressure-sensitive adhesive sheet placed on the film.

There is no unpleasant odor due to liberation of hair decomposition vaporous products; and the method is not painful.

METHOD AND COMPOSITION FOR REMOVAL  
OF HAIR FROM SKIN

The present invention relates to a depilation method for removing hair without causing pain; and to a  
5 composition for use in this method.

Any known depilatory agent is in practice used cosmetically hitherto in the form of a wax or a cream containing a depilatory agent.

10 In the case of a depilatory cream, hair is removed by applying the cream to an area of skin to be depilated, allowing it to stand for a predetermined time, and then wiping off the cream.

15 In the above method, however, care must be taken that the cream does not become smeared on clothes or other articles until the effect of the depilatory agent is exhibited after coating the depilatory cream; and in wiping off the cream, an unpleasant odor due to decomposition of hair caused by the agent is generated. Moreover, the skin tends to be irritated due to the vigorous rubbing  
20 which is needed.

In the case of a wax, hair is removed by physically pulling off the wax, which is considerably painful.

25 Accordingly, one object of the present invention is to provide a depilation method which can remove hair by its roots and without pain or generation of unpleasant odor and in a short period of time.

The depilation method according to the present invention comprises coating a depilatory agent composition comprising an aqueous solution or emulsion of a film-forming polymer compound and a depilatory agent on an area of the skin where hair is to be removed, drying the resulting coating to form a film, and then peeling off the film.

The invention also comprises the aforesaid composition.

The drying of the coating to remove the moisture can be carried out naturally or by a heat treatment using hot air, a treatment utilizing the water absorption capability of a water absorbing sheet, or a heat treatment using hot air after adhering a water absorbing sheet.

The peeling off of the film formed can be carried out by bonding a pressure-sensitive adhesive sheet to the surface of the film of the depilatory agent and peeling off the adhesive sheet together with the film.

The depilatory composition of the invention comprises an aqueous solution or emulsion (which can be a paste or gel) of a polymer compound having a film-forming ability, a depilatory agent and, if necessary, a film-reinforcing agent. In addition, if necessary, suitable amounts of additives such as an alkali agent, a hair swelling accelerating agent, a filler, a perfume and a coloring agent are included.

The depilatory composition can be an aqueous polymer compound solution comprising 1 to 70 wt%, preferably

2 to 50 wt%, more preferably 5 to 30 wt%, of at least one water-soluble polymer substance selected from polyvinyl pyrrolidone, polyacrylamide, polyacrylic acid and its salts, polyvinyl alcohol, carboxymethyl cellulose, methyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, gelatin, alginic acid salts, polyethylene glycol, gum arabic and polyvinyl methyl ether, 1 to 15 wt%, preferably 3 to 12 wt%, more preferably 3 to 20 wt%, of at least one depilatory agent selected from thioglycolic acid or its salts, strontium sulfate, sodium sulfide and potassium sulfide, and the remainder composed of water and the above described other additives, and is designed such that its viscosity is 0.1 to 1,000 poises (at 30°C), preferably 0.2 to 100 poises (at 30°C). To adjust the viscosity to such range, a small amount (about 0.1 to 10 wt%) of a viscosity-increasing agent can be used. For example, the above described water-soluble high molecular material can be used as the viscosity-increasing agent.

The depilatory composition which is an emulsion of a polymer compound comprises 1 to 70 wt%, preferably 20 to 60 wt%, more preferably 30 to 55 wt%, of at least one water-insoluble polymer substance selected from rubbers such as natural rubber and synthetic rubber, polyvinyl acetate, ethylenic copolymers, wax, homo- or copolymers of (meth)acrylic esters such as methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, isooctyl (meth)acrylate and decyl (meth)acrylate, and copolymers of polar monomers having a functional group such as an amino group, an

amido group, a hydroxyl group, a carboxyl group and an epoxy group, or polar monomers not having a functional group such as (meth)acrylonitrile, vinyl acetate, styrene, vinyl pyrrolidone and vinyl ether, and the above  
5 described (meth)acrylic acid esters, 1 to 15 wt%, preferably 3 to 12 wt%, more preferably 3 to 10 wt%, of the above described depilatory agent, and the remainder composed of water and the above described other additives, and is designed such that its viscosity is  
10 0.1 to 1,000 poises (at 30°C) and preferably 0.2 to 100 poises (at 30°C).

Examples of the alkali agents are the ammonium salt or metal salt of organic dicarboxylic acid, potassium hydroxide, calcium hydroxide, and sodium  
15 hydroxide. The alkali agent can be compounded in an amount of 0.1 to 5 wt%, preferably 0.5 to 3 wt%, based on the weight of the depilatory composition.

Examples of the film reinforcing agent are natural, synthetic or inorganic short fibers having a  
20 length of 0.1 to 14 mm, preferably 1 to 10 mm and a diameter of 1 to 50  $\mu\text{m}$ , preferably 1 to 10  $\mu\text{m}$ . The amount of the film reinforcing agent compounded is 1 to 30 wt% and preferably 2 to 15 wt% based on the weight of the depilatory composition. For the purpose of increasing the  
25 film reinforcing effect, 1 to 35 wt% of silicon dioxide,

calcium carbonate, clay, kaolin, aluminum hydroxide or the like can be used. These compounds also act as fillers.

5       An example of the hair swelling accelerating agent is urea. Furthermore, for the purpose of increasing the flexibility of the film, in the case of a water-soluble depilatory agent, polyvalent alcohols such as glycerin can be used in an amount of 1 to 15 wt% based on the weight of the depilatory agent, and in the case  
10       of an emulsion type depilatory agent, a plasticizer comprising phthalic acid derivatives such as dioctyl phthalate or dibutyl phthalate can be used in an amount of 1 to 15 wt% based on the weight of the depilatory composition.

15       The thus compounded composition is coated usually in an amount (thickness) of 0.01 to 3 mm, preferably 0.1 to 1 mm, although the amount of the depilatory agent varies depending on the region where it is applied, such as a hand or a leg.

20       A predetermined amount of the depilatory composition is coated, and under conditions that the moisture is dissipated at a high temperature, for example, in the summer season, the resulting coating is allowed to dry in the natural atmosphere to thereby form a film. Upon  
25       peeling off the film, hair the root of which has been

weakened by the depilatory medicine can be sufficiently removed, not leaving any film at the depilatory portion.

In peeling off the film of the composition, when the depilatory composition is of the emulsion type, the film becomes transparent with decreasing water due to evaporation of moisture and, therefore, the dry condition can be relatively easily determined visually and the depilation operation can be carried out without an error.

Film formation of the composition coated on a portion to be depilated can be accelerated by, as well as the above natural drying method, an additional drying means. It can be understood from the explanation as described hereinafter that the additional drying means facilitates the depilation operation in addition to the film formation.

One of such drying means is a heat treatment with hot air. This heat treatment is preferably conducted after allowing to stand the depilatory agent for several minutes after coating, thereby impregnating the depilatory agent in the composition in the hair. Usually the drying is carried out at 50 to 200°C for 1 to 10 minutes. The heat of a domestic drier, e.g. a hairdrier, is sufficient.

The film thus formed can be peeled off as such to achieve the depilation. If, in this case, a pressure-sensitive adhesive sheet is bonded to the surface of the film and peeled off together with the film, the film can be peeled off without leaving any pieces because the film and the pressure-sensitive sheet are strongly bonded.

Suitable pressure-sensitive adhesive sheet is a pressure-sensitive adhesive sheet which is prepared by coating a film-like substrate having flexibility and pliability; such as a plastic film, paper, nonwoven fabric cloth, each having a thickness of about 5 to 100  $\mu\text{m}$ , with an adhesive substance made mainly of rubber and/or synthetic resin and having pressure-sensitive adhesiveness at ordinary temperature ( $30^{\circ}\text{C}$ ) in a thickness of about 5 to 200  $\mu\text{m}$ . A more preferred sheet is a sheet which has an adhesive force to a phenol-formaldehyde resin plate of 20 to 2,000 g/cm ( $180^{\circ}$  peeling adhesive force at  $25^{\circ}\text{C}$ , tensile speed: 300 mm/min). The size of the sheet is not critical, and the sheet may be equal to or larger or smaller than the film of the composition. If the sheet has a larger area than the film, the depilation operation is simplified because a portion extending from the edge of the film forms a part for the separation. When the sheet has a smaller surface area than the film,



it is convenient to form a pick-up portion of the film by peeling off a part of the film.

Another drying means is as follows. A water absorption sheet is bonded to the depilatory agent coated and, if necessary, heat treatment is applied from the side of the water absorption sheet bonded.

In accordance with this drying means, the water absorption sheet absorbs the water contained in the depilatory agent coated in a short period of time to form a film, the film is peeled off together with the sheet to achieve the depilation or only the sheet is peeled off from the film and then the above pressure-sensitive adhesive sheet is bonded to the film and the film is peeled off together with the sheet to remove hair. In this way, the film can be removed without leaving any piece on a portion to be depilated. When, in this case, heating is applied in combination, the drying time for forming the coating can be shortened.

As the water absorption sheet, any sheet-shaped material can be used so long as it is capable of absorbing water. For example, when a porous sheet material (preferably having a thickness of 5 to 100  $\mu\text{m}$ ) such as hydrophilic nonwoven fabrics, paper, cloth and foamed sheets is used, the sheet material is integrally combined by placing it on the depilatory agent coated which is

still in a wet condition and then slightly pressing, and by drying the assembly in that state, the film is peeled off together with the water absorption sheet to remove the hair.

5 Preferred examples of other water absorption sheets are as follows. A film or sheet of a high water absorption polymer having a water absorption ratio of 10 to 1,000 times (by weight) the weight thereof, which is prepared by introducing suitable intramolecular cross-  
10 linking into a water-soluble polymer having a hydrophilic group such as a hydroxyl group, a carboxyl group or its salt, and which is insoluble in water, such as a polymer prepared by graft polymerization of (meth)acrylic acid, (meth)acrylonitrile, and maleic anhydride onto starch,  
15 cross-linked product of a copolymer of  $\alpha$ -olefin having 2 to 12 carbon atoms and maleic anhydride or its derivative, or alkali neutralized product, and polyacrylic acid salt; and nonwoven fabrics, paper and foamed products and so  
20 forth in the inside or on the surface of which the above high water absorption polymer is dispersed or laminated. The water absorption sheet made of such a high water absorption polymer absorbs water in the depilatory agent due to the water absorption capability and a coating having the desired physical strength can be formed.

The water content of the depilatory composition formed into a film by the drying treatment is controlled so as to be 0.1 to 10 wt% when the heating treatment is applied in combination, or to be 10 to 40 wt% when the heating treatment is not applied, so that the physical pain at the time of depilation can be reduced and the depilatory effect can be exhibited.

The depilation method of the present invention has the following advantages. Unpleasant odor is not generated because the odor due to decomposition of hair by the depilatory agent is masked by the polymer compound having a film forming ability. Serious pain is not felt by the action of the depilatory agent. Hair can be removed without leaving any residue by using a pressure-sensitive sheet or a water absorption sheet in combination.

The present invention is described in greater detail by reference to the following examples. Percentages and parts are by weight:

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EXAMPLE 1

	Polyacrylamide	15%
	Calcium Thioglycolate	7%
	Silicon Dioxide	3%
5	Calcium Hydroxide	2%
	Glycerin	5%
	Water	68%

A composition consisting of the above components was dissolved in water to prepare a uniform aqueous polymer compound solution (100 poises at 30°C). This depilatory agent was coated in 50 to 300  $\mu$ m thickness and allowed to stand for about 5 minutes and the portion was heated with a drier. In 5 minutes, a film (water content: 4 to 5 wt%) was formed and hair was in the condition that it was trapped in the film. Since the strength of the hair was reduced or the hair was dissolved by the effect of the depilatory agent, pain was not caused when the film was peeled off from the skin and residue was not left on the portion.

20

EXAMPLE 2

Natural Rubber Latex (50% base)	91%
Sodium Thioglycolate	7%
Sodium Hydroxide	2%
	<hr/> 100%

A composition consisting of the above components and a small amount of polyvinyl pyrrolidone as a viscosity increasing agent was mixed to prepare a uniform emulsion (30 poises at 30°C). This depilatory agent was  
5 coated on a portion to be depilated in a thickness of about 200 to 400  $\mu\text{m}$  in the same manner as in Example 1 and allowed to stand for about 5 minutes, and the portion was heated with a drier. A film (water content: 1 to 3 wt%) which was substantially transparent was formed,  
10 and by peeling off the film, the hair was removed without any pain.

### EXAMPLE 3

The depilatory composition of Example 1 was uniformly coated on a portion to be depilated in a size of about  
15 5 x 10 cm in a thickness of about 300  $\mu\text{m}$  and allowed to stand for about 5 minutes, and the portion was then heated with a drier. In 5 minutes, a film was formed, and hair was trapped in the film. A pressure-sensitive adhesive sheet piece having a width of 5 cm and a length  
20 of 11 cm (adhesive force to a resin sheet: 100 g/cm), with a polyisobutylene pressure-sensitive adhesive layer (thickness: 50  $\mu\text{m}$ ) provided on the surface thereof was bonded to the above film. The sheet was peeled off together with the film by picking up the edge of the  
25 sheet not bonded to the film to remove the hair. Since

the strength of the hair was reduced or the hair was dissolved by the effect of the depilatory medicine, the film could be removed together with the sheet without any pain, and furthermore the hair was completely removed without leaving any film residue on the portion.

EXAMPLE 4

Methyl Methacrylate-Acrylic Acid/2-Ethylhexyl Copolymer Emulsion (solids content: 40% base)	90%
Calcium Thioglycolate	7%
Calcium Hydroxide	3%
	<hr/>
	100%

A composition consisting of the above components and a small amount of polyvinyl pyrrolidone was mixed to prepare a uniform emulsion (30 poises at 30°C). This emulsion was coated on a portion to be depilated in a size of about 5 x 10 cm in a thickness of about 200 μm in the same manner as in Example 3 and allowed to stand for about 5 minutes, and the portion was heated with a drier to form a nearly transparent film (water content: 1 to 2 wt%). After making the film transparent, the same pressure-sensitive adhesive sheet as used in Example 3 was bonded. When peeling off the sheet together with the sheet, hair was completely removed without any pain, and furthermore a film residue was not left.

EXAMPLE 5

The same depilatory composition as used in Example 1 was coated on a portion to be depilated in a size of about 5 x 20 cm in a thickness of about 100 to 300  $\mu$ m, and a rayon nonwoven fabric having a width of 6 cm and a length of 12 cm was bonded thereto, followed by allowing to stand for about 5 minutes, and the portion was heated with a drier. In 5 minutes, a film was formed, and the hair was trapped in the film. This film was peeled off together with the nonwoven fabric by pulling the edge of the nonwoven fabric remaining unbonded to the film. Since the strength of the hair was reduced or the hair was dissolved by the effect of the depilatory medicine, the film could be removed together with the nonwoven fabric without any pain, and the hair could be removed without leaving any residue on the portion.

EXAMPLE 6

	Styrene/2-Ethylhexyl Acrylate Copolymer	90%
	Emulsion (solids content: 40% base)	
	Calcium Thioglycolate	7%
20	Calcium Hydroxide	3%
		<hr/>
		100%

A composition consisting of the above components and a small amount of polyvinyl pyrrolidone was mixed to prepare a uniform emulsion (30 poises at 30°C). This depilatory agent was coated on a portion to be

depilated in a size of about 5 x 10 cm in a thickness of about 300 to 500  $\mu$ m in the same manner as in Example 5, and a cotton cloth having a width of 6 cm and a length of 12 cm was then bonded thereto. The portion was heated for about 4 minutes with a drier to form a film (water content: 3 to 4 wt%). When peeling off the film together with the cotton cloth, the hair could be removed completely without any pain, and furthermore no film residue was left.

10

EXAMPLE 7

Sodium Thioglycolate	10%
Polyvinyl Acetate Emulsion (solids content: 50%)	88%
Caustic Soda	2%

A composition consisting of the above components was dissolved in water to prepare an aqueous dispersion of depilatory agent (20 poises at 30°C).

This dispersion was coated on an underarm hair of each of 10 paneller (female adults) in an amount of about 700 g/m<sup>2</sup>. A water absorbing paper was adhered to the surface of the film and was allowed to stand for about 15 minutes. The water absorbing paper was peeled off and the film (water content: about 10 wt%) was then peeled off to remove the hair.



Unpleasant odor due to the decomposition of the hair by the depilatory treatment was not substantially generated, and visual observation confirmed that skin irritation was not substantially produced.

5

EXAMPLE 8

A film was prepared in the same manner as in Example 7 except that the amount of the coating was reduced to about  $200 \text{ g/m}^2$ . To this film was bonded a pressure-sensitive adhesive sheet comprising a 30  $\mu\text{m}$  thick polyethylene film and the same pressure-sensitive adhesive layer as in Example 3 provided on the polyethylene film to conduct the depilation treatment. The same good results as in Example 1 were obtained.

EXAMPLE 9

15

A water-soluble depilatory composition (80 poises at  $30^\circ\text{C}$ ) consisting of 7% sodium thioglycolate, 1% of caustic soda and 77% of purified water was prepared.

This composition was coated on an underarm portion of each of 10 panellers in an amount of about  $500 \text{ g/m}^2$ . A high water absorption polymer comprising a polyurethane foam (thickness: 0.8 mm) with a polyacrylic acid salt dispersed therein was bonded to the coated surface and was allowed to stand for about 10 minutes. The assembly was peeled off to remove the hair. The film contained about 30 wt% of water and the depilation effect was good as in Example 1.

25

EXAMPLE 10

A water-soluble depilatory composition (100 poises at 30°C) consisting of 5% calcium thioglycolate, 20% polyvinyl pyrrolidone, 2% calcium hydroxide, 1% silicon dioxide and 72% of distilled water was prepared.

This composition was coated on underarm hair of each of 10 panellers in an amount of about 500 g/m<sup>2</sup>. A nonwoven fabric with a high water absorption polymer layer made of a starch/acrylic acid graft copolymer and having a thickness of 1,000 μm formed on the surface thereof was bonded through a polymer layer and was allowed to stand for about 8 minutes. The assembly was peeled off to remove the hair. The film contained about 30 wt% of water, and the depilatory effect was good as in Example 1.

EXAMPLE 11

	Methyl Methacrylate/2-Ethylhexyl Acrylate Copolymer Emulsion (solids content: 38% base)	86%
	Calcium Thioglycolate	7%
	Vynlon Short Fibers (length: 3 mm, diameter: 2 to 4 μm)	5%
20	Calcium Hydroxide	2%
		<hr/> 100%

A composition consisting of the above components and a small amount of polyvinyl pyrrolidone was mixed with water to form a uniform polymer compound-

containing emulsion (35 poises at 30°C). This depilatory agent was coated on a portion to be depilated in a thickness of about 100 to 300  $\mu$ m and allowed to stand for about 5 minutes, and the portion was treated by heating with a drier. In 5 minutes, a film was formed, and the hair was trapped in the film. Since the hair was reduced in strength or dissolved by the effect of the depilatory composition, the film could be removed without any pain. Furthermore, the hair could be completely removed without leaving any residue.

CLAIMS:

1. A depilation method which comprises coating a depilatory composition containing an aqueous solution or emulsion of (a) a polymer having a film forming ability  
5 and (b) a depilatory agent on an area of skin from which hair is to be removed, drying the resulting coating to form a film, and peeling off the film together with the hair.
2. A method as claimed in Claim 1, wherein the polymer  
10 is water-soluble and is selected from polyvinyl pyrrolidone, polyacrylamide, polyacrylic acid and its salts, polyvinyl alcohol, carboxymethyl cellulose, hydroxypropyl cellulose, gelatin, alginic acid salts, polyethylene glycol, polyvinyl methyl ether and gum arabic.
- 15 3. A method as claimed in Claim 1, wherein the polymer is water-insoluble and is selected from natural rubber, synthetic rubber, wax, polyvinyl acetate, ethylene copolymers, homo- and copolymers of acrylic acid or methacrylic acid esters, and copolymers of polar monomers  
20 containing or not containing a functional group and/or acrylic or methacrylic acid esters.
4. A method as claimed in Claim 1, 2 or 3, wherein the viscosity of the depilatory agent is 0.1 to 1,000 poises at 30°C.
- 25 5. A method as claimed in any preceding claim, wherein the composition comprises 1 to 15 wt% of the depilatory agent, 1 to 70 wt% of a water-soluble or water-insoluble polymer and the remainder being water and other additives.

6. A method as claimed in Claim 5, wherein the composition contains 0.1 to 5 wt% of an alkali agent.

7. A method as claimed in any preceding claim, wherein the drying treatment is by heating.

5 8. A method as claimed in Claim 7, wherein the heating is conducted at a temperature of 50 to 200°C for 1 to 10 minutes.

9. A method as claimed in any preceding claim, wherein the drying treatment is conducted by placing on the  
10 film a water-absorbing sheet.

10. A method as claimed in any preceding claim, wherein the water content of the film before peeling is 0.1 to 40 wt%.

11. A method as claimed in any preceding claim, wherein  
15 in a pressure-sensitive adhesive sheet is adhered to the surface of the film and the assembly is peeled off.

12. A method as claimed in Claim 11, wherein the areal size of the pressure-sensitive adhesive sheet is larger than that of the film.

13. A method as claimed in any preceding claim, wherein  
20 in the depilatory composition also contains a film-reinforcing agent.

14. A method as claimed in Claim 13, wherein the film-reinforcing agent consists of short fibers.

15 15. A depilatory composition as defined in any of Claims 1 to 5, 6, 7, 13 or 14.

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